

SYNTAX

SERVING
THE TIMEX-SINCLAIR FAMILY
OF PERSONAL COMPUTERS

A PUBLICATION OF THE HARVARD GROUP

VOL. 3 NO.10

ISSN 0273-2696

OCT, 1982

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SQ, SYNTAX QUARTERLY, is coming next month! All SYNTAX subscribers get the first issue free.

ASCII PROGRAM FOR ZX/TS COMPUTER

CAI just announced an ASCII program to let the ZX/TS computers equipped with CAI/O boards operate as a standard ASCII CRT terminal. The program is on an EPROM that goes on the I/O board and is priced at \$24.95 (plus \$1.95 S&H). Contact CAI Instruments, P.O. Box 2032, Midland, MI 48640.

QUICK TAPE LOADING AND SAVING BY MINDWARE

Mindware revolutionizes tape loading with 20 new QUICKLOAD software packages for TS1000s and ZX81s. QUICKLOAD software loads/saves 6x faster than current ZX/TS software and verifies whether the program loaded properly. Prices range from \$9.95-\$24.95. QUICKLOAD software includes game, programming aid, business and engineering programs. Mindware will start mass market distribution Nov.1 and plans to be in 10,000 stores Jan 1.

EDUCATION WORKSHOP SERIES EXPANDED

Technical Education Research Centers, Inc. (TERC) is expanding its workshop series, Microcomputers in Education, to 14 national sites this year. Workshops are designed for professional development for educators (elementary through college) emphasizing hands-on experience with micros including ZX/TS computers. Evening symposia will address microcomputer applications in education. Sharon Woodruff, TERC, 8 Eliot St., Cambridge, MA 02138, 617/547-3890.

LONDON MICROFAIR SHOW GUIDES AVAILABLE AGAIN

We now have a limited supply of show guides from the last London ZX Microfair. Guides list British ZX suppliers and products, \$3.50, first class mail. SYNTAX, RD 2 Box 457, Harvard, MA 01451.

NEW PRODUCTS AND SERVICES

ZX DATA FINDER, a high capacity text/file manager, gives programmers interested in file and data storage techniques on ZX/TS computers an advanced course on the subject and a versatile catalog/index/reference tool. The program requires at least 16K RAM. Price for the listing with a detailed explanation of all edit, search and display routines is \$9.95. Free info. Tom Woods, Box 64, Jefferson, NH 03583.

Hunter just announced an 8K non-volatile RAM board filling an unused 8K block of memory (8K-16K) in the 16K ZX/TS system. A sample rapid display routine, procedures for storing utilities on tape and a 14-page manual come with the kit. A board, sockets, resistors and all components are included. It also comes with lithium cell (which maintains sufficient reserve power for about 10 months for 2K or for about 2 months for a fully populated board). A 2K CMOS 6116P-3 RAM is also supplied. A connector is available for an alternative external supply. \$29.95 by check or MO to Hunter, 1630 Forest Hills Drive, Okemos, MI 48864. Circuit board and instructions are available separately for \$15 ppd.

1981-82 NFL Statistical Summary for the ZX81 with 16K is available from Miller-Zamis, Inc., 251 First St., Willis Day Industrial Park, Perrysburg, OH 43551, 419/666-2410. Zamis Engineering is also involved in developing a robot which uses the ZX81 as the main control unit. After finishing the project they may sell both plans and kits.

KRAKIT, from International Publishing and Software, is a treasure hunt game that has 12 clues and offers a bounty of \$20,000 to the first entrant to solve all the clues successfully. The game is on

cassette for the ZX81 and TS1000 with 16K RAM and will not be officially released until Oct. 15. To keep entrants informed on the status of the contest, a 24-hour answer line will be in operation when the contest is underway. **KRAKIT** will be sold in retail stores, or order direct from International Publishing and Software Inc., Box 1654, Buffalo, NY, \$19.95 plus \$1.50 S&H. Address dealer and distributor inquiries to: International Publishing and Software 5952 Chesswood Dr, Downsview, ONT, Canada, M3J 2W6. In the U.S., Ms. Kearns in NY at 212/490-7957.

The Home Clock Family Bulletins Program gives date, update of the time, display of your bulletins, and an alarm display area. When returning to menu from clock screen you don't need to reset the time. \$20 check or MO for documentation and tape. King Software, 85 Myrtle St., Lowell, MA 01850.

Hamrich International is sponsoring a game for ZX80/81 users with a \$50 cash award to the winner. For information on the ZX80 Word Game, contact Hamrich International, P.O. Box 505, Carmel CA, 93921, 408/624-7737. Get entries in by Oct. 15.

A.&P. Electronics offer everything in stock at close out prices. For additional information, call them at 916/483-8772.

Have problems loading tapes and overheating in your ZX80? The TL-064 module (\$19.50, Canadian) and the OP-032 module (\$14.95, Canadian) may help. P. Pollak, 6240 Halifax St., North Burnaby, B.C., Canada V5B 2P6.

A directory of educational computing has just been published by the staff of "Classroom Computer News." It gives over a 1000 listings, a one-year calendar of national and regional events and conferences,

guidelines for selecting hardware and software for the classroom and a yellow pages listing computer services and products. The Directory is available in bookstores and computer stores for \$14.95/softcover and \$29.95/hardcover. For info on the upcoming Directory or the bimonthly magazine, "Classroom Computer News", write or call CCN, 341 Mt. Auburn St., Watertown, MA 02172, 617/923-8595.

The National Association For The Cottage Industry will hold its first regional conference on Oct. 23 at the Americana-Congress Hotel in Chicago from 9:00am to 4:00pm. Some workshops topics are: "How to Make Money in the Craft Industry", and "Rural America and the At-Home Industry." Send a \$15 check to attend; add \$15 if you want to have "Luncheon with the Experts." The National Association For the Cottage Industry, P.O. Box 14460, Chicago, IL 60614, 312/472-8116.

The E-Z Key keyboard for ZX81/1000 has 60 keys, including 8 special keys with electronic control. Single key functions are: DELETE, EDIT, Single and Double Quotes, Colon, Semi-colon, STOP and Function. Comes with cables and instructions. Can be adapted to ZX80 or MicroAce. \$70 plus \$4 (S&H). E-Z Key, Suite 75, 711 Southern Artery, Quincy MA, 02169.

"The Writing Instructor", a quarterly journal on computers and writing instruction is looking for authors. R. Adams, Univ. of S. CA, Los Angeles, CA 90089-1219.

SYNTAX ERRORS: Machine Code Screen Fill (Aug.82 p.6) contains two errors. In the description of the REM line, "inverse H" should say "graphic H". The assembly listing comment for location 16522 should read "C<>0". For location 16526 it should read "B<>0".

USERS' GROUPS

Our latest list of new users' groups is presented below. To check for a group in your area not listed here, drop us a line (please include a self-addressed stamped envelope) or give us a call and we'll refer you to any group we know of. To list your group, write us or give us a ring and we'll refer interested people to you. SYNTAX, RD 2 Box 457, Harvard MA 01415, 617/456-3661.

Des Plaines, IL: Circle Chess Group, A.F. Stanonis, P.O. Box 63, Des Plaines, IL 60017.

Detriot, MI: Timex-Sinclair Users Group, P.O. Box 552, Warren, MI, 48090. Send SASE for details.

Indiana, S. Illinois, S.W. Ohio, N.W. Kentucky: The FUN-Z, P.O. Box 914, Jasper, IN 47546, contact W. Long with SASE.

Iowa City, IA: Jim Carroll, 1218 William St., Iowa City, IA 52240. 319/351-8031.

Joplin, MO: Carlos T. Colon, 1228 Picher, Joplin, MO 64801, 417/781-7758.

New Albany, IN: G. Richard Becht, 2308 Beeler St., New Albany, IN, 47150.

Phoenix, AZ: Randy Saxton, 4827 N. 63rd Dr., Phoenix, AZ 85033, 602/846-2882.

Plattsburgh, NY: Upstate New York ZX81 Users, Vern Olson, 13 Dennis Ave., Plattsburgh, NY, 12901.

Research Triangle Park, NC: John Drummond, P.O. Box 12546, Research Triangle Park, NC 27709.

Washington, D.C.: Washington Area Users Group, Box 6239, Washington, DC, 20015, 703/920-7310.

PROGRAM IMPROVEMENTS/REFINEMENTS

Mark Freitas' Sine Name (Aug.82) raises the question: can I make the message snake up the screen letter by letter? My solution:

```

10 LET N=1
20 INPUT A$
30 LET J=LEN A$
40 FOR A=0 TO 6.3 STEP .2
50 LET Y=SIN A
60 PRINT AT 21, (10*Y+10);A$(N)
70 SCROLL
80 IF N=J+1 THEN LET N=1
90 NEXT A
100 GOTO 40
SYNTACTIC SUM: 11077,8K

```

Next, can the message be made to oscillate about a horizontal and diagonal line? Without using machine language, the answer is not readily apparent.

Frederic D. Bogar, Key West, FL

When using Larry Lockwood's MC line renumbering program (Jun.82), if your new starting line number (X) and/or step size (Y) are greater than 255, then

```

POKE 16518,X-INT (X/256)
POKE 16519,INT (X/256)
POKE 16534,Y-INT (Y/256)
POKE 16535,INT (Y/256)

```

These statements work for any value of X and Y.

The last byte in the MC program, EB, isn't the EXchange instruction. It is the second byte of the 2-byte JR instruction.

The MC program occupies only 27 bytes of RAM, so why is it listed as 16K? If you use his BASIC program to POKE the MC program above RAMTOP, you must change the values in lines 90, 130 and 140 accordingly, eg., for 2K RAM:

```

90 FOR X=18405 TO 18431
130 POKE 16388,229
140 POKE 16389,71

```

Harold Miller, Clarkesville, GA

Some added changes for Hexadecimal Math given by Leo Morgan (3/82).

```

500 DIM N(2)
590 LET Y=Y$(2 TO )
610 FOR X=1 TO 4
530 LET H(X)=(INT Q*16)+28

```

You can simplify the parentheses:

```

580 PRINT CHR$(H(4));CHR$(H(2));C
HR$(H(1))

```

The decimal to hexadecimal conversion routine was always returning 0000 because the formula used for 4K integer math gives a different answer with 8K floating point math. It will be interesting to see how that comes up in other programs.

Ron Miller, Murrys ville, PA

Here's an improvement to Ian Logan's Bytes Remaining--8K (Dec.81) which I think more accurately represents of the number of available bytes for a BASIC program. As you will note in the disassembly listing, the actual stack pointer address is subtracted from STKEND.

As in Dr. Logan's program enter the following line as the first line of a BASIC program:

```

1 REM EORND FAST AT 5 T GOSU
B PI FAST AT TAN

```

Again start by entering, GOSUB PI FAST AT TAN and then backspace to add 1 REM etc. Note the two spaces between 5 and T. Call the routine in the immediate mode (no line #s) by PRINT USR 16514. On a 1K machine and just line 1, the display should give 821 bytes free.

I could have saved 2 bytes with LD BC,(NN) but 4B hex is not a character on the ZX81.

Max.Bytes Remaining

1K RAM	1024 Bytes
Sys Var	125
Display File	25
Var End 80H	1
GOSUB Stack	3
Mach Stack	14

856

More Bytes Remaining

Routine =	821 Bytes
1 REM...	+20

841

There is a difference of 15 bytes. As far as I can tell there are about 14 bytes in the machine stack after initialization. I'll

have to dig up a disassembly of the 8K ROM to be sure.

William Wentz, Rio Rancho, NM

Character	Code	Hex	Hex Format	Z80 Mnemonic	Comment
E	42	2A	2A 1C 40	LD HL,(401C)	;Load the address at the ;end of the Calculator ;stack, held at (STKEND)= ;401C hex=16412 dec, into ;HL register
Ø	28	1C			
RND	64	40			;Review pgs. 128,134 of ;ZX81 Manual
FAST	229	E5	E5	PUSH HL	;Push address(STRKEND) to ;stack
AT	193	C1	C1	POP BC	;Pop address(STKEND) off ;stack and store in regis- ;ter BC
5	33	21	21 00 00	LD HL,0000	;Load register HL with ;all zeros.
sp	Ø	00			
sp	Ø	00			
T	57	39	39	ADD HL,SP	;Add the address stored ;in the SP register to the ;HL register.
GOSUB	237	ED	ED 42	SBC HL,BC	;Subtract the address ;(STKEND) stored in BC ;from the address(SP) ;stored in HL. The ;results are-- ;stored back in HL.
PI	66	42			
FAST	229	E5	E5	PUSH HL	;Push the results stored ;in HL to the stack.
AT	193	C1	C1	POP BC	;Pop the results off ;stack and store in BC
TAN	201	C9	C9	RET	;Return to Basic and ;Print value in ;BC. The number ;displayed is the number ;of bytes remaining.

The address of the 1st byte is 16514.

Jon Passler's Bar Chart (Jan.82 and improved in Feb.), has a problem. It can't accomodate a data entry of 0 an important data point. The program stops with the first

```

1 DIM B$(15,4)
2 FOR X=1 TO 15
3 INPUT B$(X)
4 NEXT X
20 FOR A=11 TO 21
30 PRINT AT A,1;"-"
40 NEXT A
50 PRINT AT 11,0;"2";AT 16,0;"
1";AT 21,0;"0"

```

```

60 FOR A=1 TO 15
70 FOR P=1 TO (VAL B$(A))/100+
.5
80 PLOT A*2+3,P
90 NEXT P
100 NEXT A
SYNTACTIC SUM: 16086. 8K
empty data point in the array B$(A)
and generates a run report C/70. A
0 is accepted as a data point and a
line is saved. Like Jon's program,
a GOTO lets you run it again.

```

Frederic D. Bogar, Key West, FL

WHEN YOUR COMPUTER GETS FULL

Because your computer has limited storage space, a time will come when you run out--inevitably in the midst of your brilliant first program. Remain calm. You can get the space you need.

Here are some signs that you are running out of space:

1) The listing starts shortening. Normally, you can put 22 lines of program on the screen. The line you're entering can use the bottom 2 lines. When memory gets tight, you get fewer than 22 lines of program display and the working space moves to mid-screen.

2) After typing in a line, you press ENTER, yet ENTER seems to have no effect.

3) ENTER may cause a line to disappear altogether.

4) When you're really low on memory, characters you type simply will not appear on the screen. This is because the computer has no room to both store and display your input. It chooses to store it. So your program line is in the computer, but you cannot see it.

First get rid of those lines that are not crucial to the running of the program. Try deleting some of your REMark statements.

Next, you can shorten strings (which, remember, are within quotes) by making shorter statements. For example, change

```
30 PRINT "ENTER PLAYER" to  
30 PRINT "ENTER PLY"
```

Also, keystrokes take up one byte as opposed to spelling the command out. For example, "TO" spelled out takes up two bytes. Shift 4 (TO) uses only one.

Constants, numbers with values that are stored within the program, also take up extra space.

If you use a constant, say 0, often, define it as a variable. Instead of using LET A=0, set another variable equal to 0: LET X=0. Then LET A=X. X takes one byte each time you use it. 0 takes

six. Though you spend some memory to set X equal to 0, if your program uses 0 many times, you save in the long run.

You can also shorten variable names. But remember when compacting a program you sacrifice readability to a certain degree. For example:

```
80 LET PLAYER=P  
80 LET PLY=P
```

Get familiar with the hierarchy of algebraic functions to gain extra space by using fewer parentheses. For example: $(4*3)+2$ can be rewritten as $4*3+2$. But, $(4+2)*3$ can't be rewritten as $4+2*3$ because the computer multiplies first giving a different answer.

Eliminate STOP statements at the end; your program stops when it runs out of lines.

If you have a display in your program, gain space by compressing it into the left corner. The same lines displayed on the right side of the screen take more memory.

By writing a program in modules that don't pass variables between one another, you can also save yourself some space. But remember to include a CLEAR statement at the beginning or end of each module. For example, a user-friendly intro at the start of your program may ask the user's name and store it in a string variable. If you never use that variable in the rest of the program, insert a CLEAR statement after that intro routine to free the space that string variable used. And finally, FOR-NEXT loops are more efficient in memory than programmed loops despite the fact that they use 18 bytes (1 byte for character/token, 5 bytes for number, 1 byte at end).

```
FOR X=1 TO 5  
NEXT X
```

uses less space than:

```
X=1  
LET X=X+1  
IF X<=5 THEN ....
```

Try these suggestions when you need those few extra bytes.--PPW

MONSTERS--8K/16K

In this game you (represented by a 0) try to avoid four monsters (represented by Xs). You must go through a randomly generated maze, get to the other side and land on a black bar without being caught by a monster.

To move, hit a key from 1 to 8. Hitting 1 allows you to move to the upper left and hitting 4 allows you to move to the upper right. Keys 5 through 8 allow you to move in the direction of the arrow on that key.

To play again, just hit ENTER. To end the game, hit the N key and ENTER. If you can't get through the maze you may exit the program by hitting BREAK. You can rerun the program by hitting RUN and ENTER.

Robert Ryan, Gladstone, OR

```

1 GOTO 9900
2 LET J=P
3 LET P=P+((INKEY$="8")-(INKEY$="5")+((INKEY$="6")-(INKEY$="7")))*33+(((INKEY$="3")-(INKEY$="1"))*34+(((INKEY$="2")-(INKEY$="4"))*32)
4 LET P=P+(PEEK P=118)
5 IF NOT P=J THEN POKE J,0
7 IF PEEK P=8 OR PEEK P=61 THEN LET P=J
8 IF PEEK P=5 THEN GOTO 8000
9 POKE P,52
10 RETURN
11 FOR I=1 TO 4
12 GOSUB 2
14 LET J=A(I)-D
16 LET K=P-D
17 LET L=INT (K/33)
19 LET K=K-L*33
20 LET J=J-SGN (((INT (J/33)-L)*33-SGN (((J-INT (J/33)*33)-K)
22 POKE A(I),0
24 IF (PEEK (D+J) <> 118 AND ((PEEK (D+J)=8) AND INT (RAND*9)+1) < 4)) OR PEEK (D+J)=0 OR PEEK (D+J)=52 THEN LET A(I)=D+J
25 IF PEEK A(I)=52 THEN GOTO 9000
26 POKE A(I),61
28 NEXT I
30 GOTO 11
8000 POKE P,151
8001 PRINT "YOU HAVE PROVED YOURSELF TO BE SUPERIOR TO THE SKELETONS YOU WERE PITTED AGAINST."
8002 GOTO 9002
9000 POKE A(I),180
9001 PRINT "YOU HAVED PROVED TO BE INFERIOR TO THE SKELETONS YOU WERE PITTED AGAINST. YOUR RACE WILL BE ELIMINATED FROM SOCIETY."

```

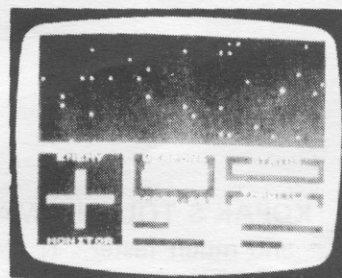
```

9002 PRINT "PLAY AGAIN? (Y/N)"
9004 INPUT A$
9006 IF A$="N" THEN STOP
9008 CLS
9000 LET P=VAL "133+PEEK 16396+256*PEEK 16397"
9001 FAST
9002 DIM A(VAL "4")
9006 FOR I=SGN PI TO VAL "4"
9012 LET A(I)=VAL "49+PEEK 16396+256*PEEK 16397"+INT (RAND*6)+INT (RAND*5+1)*33
9014 NEXT I
9016 FOR I=SGN PI TO VAL "6"
9018 FOR J=SGN PI TO VAL "20"
9019 LET A$=" "
9020 IF VAL "I=1 OR I=8" THEN LET A$="X"
9021 PRINT A$(VAL "INT (RAND*8)+1">5"+SGN PI);
9022 NEXT J
9024 PRINT " "
9026 NEXT I
9028 SLOW
9037 LET D=VAL "PEEK 16396+256*PEEK 16397+1"
9038 POKE P,CODE "0"
9040 GOTO VAL "11"
SYNTACTIC SUM: 5701, 2K/16K

```

Chief Editor, Ann Zevnik, will be taking a 2 week leave of absence from SYNTAX to get married. Ann is returning to her home town Peoria, IL, for the big day on Oct. 9.

SCOUT FIGHTER W/JOYSTICK?



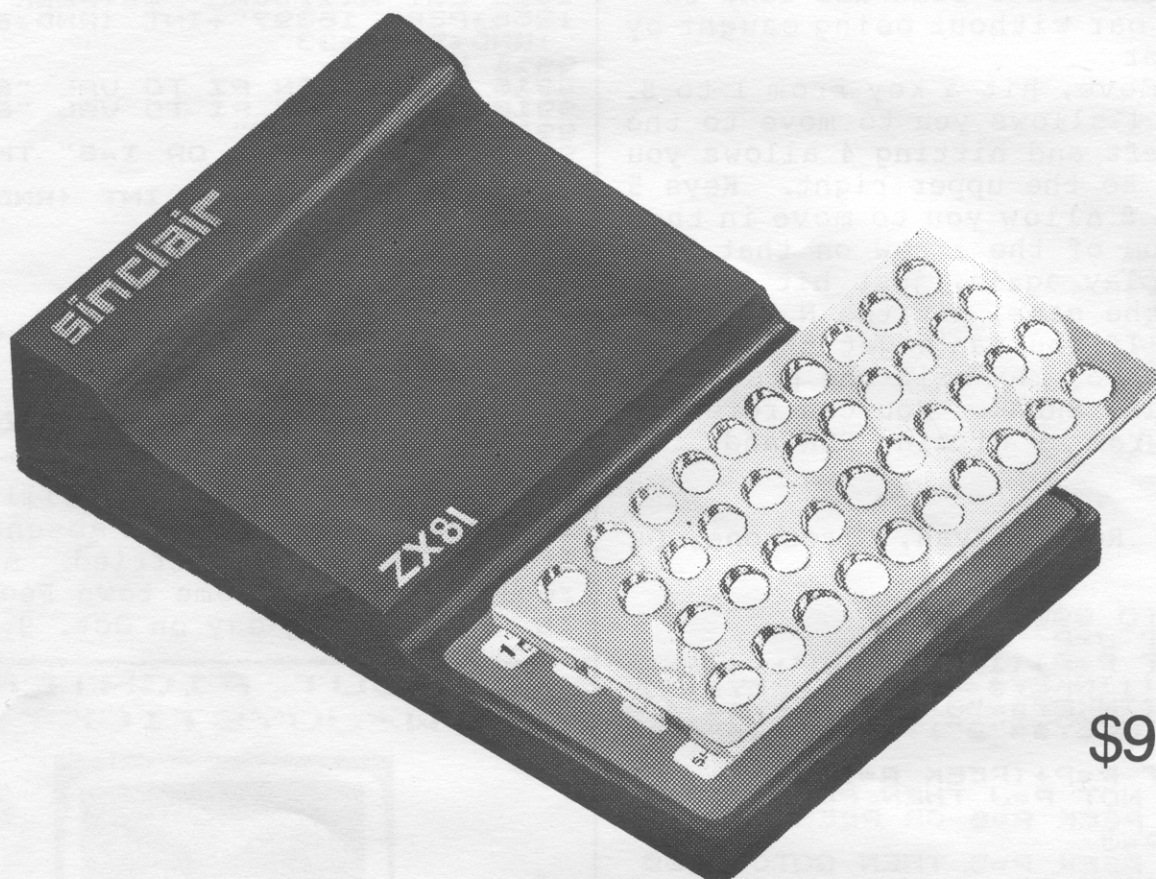
Yep. \$2.50 (postpaid) gets you UPDATE, a booklet that guides you thru the easy steps of hooking up a joystick to a ZX81. Besides listing all possible keys your joystick can "enter", UPDATE gives you the addresses and codes for poking SCOUT into one of the best games around.

If you want to order SCOUT AND UPDATE, send \$19.95 which includes \$2.50 S&H.

If you want a catalog, just ask. If you live in Europe, ask DELTASOFT, Osterfeld str. 79D, D-2000 Hamburg 54 Germany.

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HARDWARE REVIEW

Product: VOTEM interface board
From: Down East Computers, P.O.
Box 3096, Greenville, NC
27834.

Price: \$39.95 Kit
\$59.95 Assembled & Tested

VOTEM stands for voltage and temperature, and that's what this new interface from Down East Computers is all about. It comes with all the necessary components to measure temperatures with a resolution of 0.04 degrees C and voltages with a resolution of 50 microvolts.

I assembled the kit version in about 2 hours. Despite a few confusing moments, the instructions were very good. When you're all finished, you have something you can really admire: the board is slickly sandwiched between two flat black panels for a very professional look.

VOTEM measures analog signals (voltage and temperature) by converting them into a frequency, and then measuring the frequency using a machine language program. This technique makes the hardware inexpensive and the sampling speed slow, so this interface is not suited to applications where speed is important. Calibration is done entirely in software, which leads me to be wary of very high precision applications.

The software (in the form of listings) that accompanies the VOTEM is enough to get you started and working on your own, but don't expect it to turn your ZX/TS computer into a multimeter. The manual describes how to set up the interface to measure larger voltages (the stock interface measures between 0 and 1 volt), a resistance thermometer probe (more accurate than the stock probe), a game paddle, and a light detector.

As a convenience, the VOTEM includes facilities to route the

cassette output through the on-board comparator, which cleans up the signal and can read tapes not otherwise readable. In addition, an earphone jack is provided to monitor the loading process, and an LED blinks to the program. (Hint: Remove capacitor C2 and replace it with a short. This will make the LED brighter, but it disables protection against plugging the power into the VOTEM output jack.)

I have only two complaints. First, VOTEM's jack arrangement is inconvenient, forcing me to route wires awkwardly. Second, the unit radiates a fair amount of interference, which can make your television picture unviewable if it is already bad. If you do not already have interference, the VOTEM should not cause problems.

Down East has brought a good idea into the marketplace: for low-speed, high-precision, single channel analog to digital conversion the VOTEM is a bargain.--EO

IT'S HERE!! The keyboard you have been waiting for!

A LARGE 60 KEY TACTILE FEEL KEYBOARD (MEASURES 10" x 4") THAT PLUGS INTO THE SAME CONNECTORS AS EXISTING KEYBOARD ON YOUR ZX81 OR TIMEX SINCLAIR 1000. IT HAS ALL SILKSCREENED LEGENDS IN 3 COLORS ON THE BASE; MOLDED LEGENDS & GRAPHICS ON KEY TOPS; 8 AUTOMATIC SHIFT KEYS (NO SHIFTING REQUIRED) FOR EDIT, DELETE, SINGLE & DOUBLE QUOTES, COLON, SEMI-COLON, FUNCTION & STOP; 5" SPACE BAR; 2 SHIFT KEYS; NUMERIC KEY PAD.

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QUINCY, MA 02169**

GRADING PROGRAM--8K/16K

This grading program includes 37 student names--enough to satisfy most classroom situations.

To enter the program, follow the 4-line pattern in lines 500-509. Use as many modules, incremented by 10, as you need to list all student names (up to line 880). The line after the last module must read GOTO 1300 (line 890 in this listing).

After entering the program press RUN and ENTER. You get a prompt "CLASS?" Enter the name of the class (eg., Algebra 9). You get a prompt "Grading Period Number?" Enter the grading period (eg., 1) and ENTER. It prints the grading period number and gives you another prompt "PRESS NL TO CLS AND CALL UP FIRST STUDENT NAME" Press ENTER and the first student name appears. Type each numerical grade, pressing ENTER after each entry. After the last numerical grade, enter any number greater than 100 and press ENTER. The average and letter grade appears next to the student name. (This makes use of the PRINT AT command.) Press ENTER to see the next student name. Follow the same pattern.

To exit the program before you have finished, enter a negative number following the student name and hit ENTER. Line 240 is a round-up cut-off routine. You may wish to edit this to suit your needs.

Lines 220-330 determine the grading scale. Edit this to suit your own grade scale.

Robert Demunbrun, Rushville, IN

```

1 REM GRADING PERIOD GRADE
2 REM AVERAGE AND LETTER GRAD
3 REM WITH STUDENT NAMES
4 REM BY R.M.DEMUNBRUN
10 PRINT "CLASS"
20 INPUT C$
25 PRINT C$
30 PRINT
33 PRINT "GRADING PERIOD NUMBE
R?"

```

```

35 INPUT G$
37 PRINT G$
40 PRINT
42 PRINT "PRESS NL TO CLS AND
CALL UP 1ST STUDENT NAME"
50 LET X=500
53 LET N=0
56 LET G1=0
57 LET Z$=""
58 INPUT Z$
59 CLS
70 GOTO X
90 INPUT G
100 IF G>100 THEN GOTO 200
110 IF G<0 THEN GOTO 1300
120 LET N=N+1
130 LET G1=G1+G
140 PRINT TAB 2;"GRADE";TAB 27;
G
150 GOTO 90
200 LET A=G1/N
210 LET A1=INT ((INT (100*(A+.5
)))/100)
220 IF A1<70 THEN GOTO 905
230 IF A1<73 THEN GOTO 935
240 IF A1<78 THEN GOTO 955
250 IF A1<80 THEN GOTO 995
260 IF A1<83 THEN GOTO 1025
270 IF A1<90 THEN GOTO 1055
280 IF A1<90 THEN GOTO 1085
290 IF A1<92 THEN GOTO 1115
295 IF A1<94 THEN GOTO 1145
300 IF A1<95 THEN GOTO 1175
310 IF A1<96 THEN GOTO 1205
320 IF A1<98 THEN GOTO 1235
330 IF A1<=100 THEN GOTO 1265
340 PRINT "AKERS,J"
350 LET X=X+10
360 PRINT
370 GOTO 50
380 PRINT "ANSON,A"
390 LET X=X+10
400 PRINT
410 GOTO 50
420 PRINT "ANSON,R"
430 LET X=X+10
440 PRINT
450 GOTO 50
460 PRINT "BAKER,S"
470 LET X=X+10
480 PRINT
490 GOTO 50
500 GOTO 1300
510 PRINT AT 0,20;A1;AT 0,30;"F"
520 PRINT
530 GOTO 53
540 PRINT AT 0,20;A1;AT 0,30;"D"
550 PRINT
560 GOTO 53
570 PRINT AT 0,20;A1;AT 0,30;"D"
580 PRINT
590 GOTO 53
600 PRINT AT 1,20;A1;AT 0,30;"D"
610 PRINT
620 GOTO 53
630 PRINT AT 0,20;A1;AT 0,30;"C"
640 PRINT
650 GOTO 53
660 PRINT AT 0,20;A1;AT 0,30;"C"
670 PRINT
680 GOTO 53
690 PRINT AT 0,20;A1;AT 0,30;"C"
700 PRINT
710 GOTO 53
720 PRINT AT 0,20;A1;AT 0,30;"C"
730 PRINT
740 GOTO 53
750 PRINT AT 0,20;A1;AT 0,30;"C"
760 PRINT
770 GOTO 53
780 PRINT AT 0,20;A1;AT 0,30;"C"
790 PRINT
800 GOTO 53
810 PRINT AT 0,20;A1;AT 0,30;"C"
820 PRINT
830 GOTO 53
840 PRINT AT 0,20;A1;AT 0,30;"C"
850 PRINT
860 GOTO 53
870 PRINT AT 0,20;A1;AT 0,30;"C"
880 PRINT
890 GOTO 1300

```



```

1090 PRINT
1100 GOTO 53
1115 PRINT AT 0,20;A1;AT 0,30;"B"
-
1120 PRINT
1130 GOTO 53
1145 PRINT AT 0,20;A1;AT 0,30;"B"
-
1150 PRINT
1160 GOTO 53
1175 PRINT AT 0,20;A1;AT 0,30;"B"
+
1180 PRINT
1190 GOTO 53
1205 PRINT AT 0,20;A1;AT 0,30;"A"
-
1210 PRINT
1220 GOTO 53
1235 PRINT AT 0,20;A1;AT 0,30;"A"
-
1240 PRINT
1250 GOTO 53
1265 PRINT AT 0,2;A1;AT 0,30;"A+"
-
1270 PRINT
1280 GOTO 53
1300 STOP
SYNTACTIC SUM: 23348, 8K/16K

```

```

10 LET P=655106
20 FOR X=0 TO 8191
30 LET P=P-PEEK X
40 NEXT X
50 IF P=0 THEN PRINT "ROM OK"
New 8K ROM test--good ROMs give OK.

```

LOADING WITH SYNTACTIC SUM

Loading with the Syntactic Sum is a simple way to guarantee that programs loaded by the 8K ROM don't run if they suffer from parity problems.

The following program utilizes a technique from SYNTAX's Syntactic Sum program. First, LOAD the Syntactic Sum program and another program. When you SAVE the second program on tape, the Syntactic Sum program is called. The value returned is saved in variable B. Next, the program and the variable are saved to tape.

The next time you LOAD your program, the Syntactic Sum will be called and compared to the value obtained when you saved your program. If the two values do not match, a parity error has occurred and the program stops before executing. The address 18400 in 9990 is the location of the Syntactic Sum program for a 2K RAM and must be adjusted for other RAM sizes.

```

9990 LET U=18400
9991 IF PEEK U=33 THEN LET B=USR
U
9992 SAVE "PROG"
9993 IF PEEK U<>33 THEN RUN
9994 LET A=USR U
9995 IF A=B THEN RUN
9996 PRINT "ERROR S/S=";A;,"WANT
ED=";B
9997 STOP
9998 RUN
SYNTACTIC SUM: 9272, 8K

```

These comments correspond to the preceding program:

9990 Point to Syntactic Sum area.

9991 If 'ss' is in storage get checksum value.

9992 Save program with Checksum Variable.

9993 'ss' is not in storage, ignore.

9994 Get loaded Checksum value.

9995 Checksum at LOAD time is the same as at SAVE time; ok to execute.

9996 Inform operator of error.

9997 Wait for operator reply.

9998 Ignore error, continue to execute.

Allen M. Brosco, Carson, CA

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DEAR EDITOR

To establish a feel for my ZX81 keyboard, I placed a spot of white glue on the center of each key. I used white glue because it is transparent when dry. This worked beautifully for a while but then peeled off. I was back at square one with another solution--Epoxy.

I mixed a small quantity of Epoxy, picked up a little on the end of a toothpick and placed it in the center of each key. It dries as a small transparent dome and stays put. I have been using it now for a month and have developed a feel for the keyboard which was not possible before.

H.S. Wake, San Diego, CA

I had a problem saving and loading programs on the ZX81. The problem was the noise level of the recorder when it was first turned on. By starting the recorder and allowing it to settle down (monitored via the led on the recorder) and then saving the program, it worked very well. I noticed that if I allowed the ZX81 to warm up before attempting to load the program, my success rate was almost 100%. If I attempted to load immediately I did experience errors in loading. Saving a second copy of a program back-to-back is also a good suggestion.

Gil Grabowski, Hanson, MA

SYNTAX recommends a 15 sec. delay when saving programs. Type SAVE "name", start your recorder, wait 15 sec., then press ENTER. When the screen clears, let the recorder run, type SAVE "name", ENTER again. Now you have the program saved twice--use these programs to find the proper volume setting on your recorder. Also use a short tape (C-30 or shorter) for better loading and saving. (We use C-10s).--KO

To prevent poor contact between the computer and the power supply or tape recorder, I arrived at the following solution.

For the power supply, I carefully removed the insulation around the tip of the plug so I could identify each of the leads. I soldered these leads to the proper contacts of the socket inside the computer. I cut the lead to the power supply, leaving about a 6-inch length of wire outside the case. I installed a \$.99 Radio Shack polarized plug to complete the circuit.

I used the short leads supplied with the ZX81 in the same way for the tape recorder. This solution seems safer to me because disconnecting the computer after using it puts no strain on the weak contacts within the ZX81.

Stewart B. Crooks, Jensen Beach, FL

When I bought my ZX81 I was more interested in using published software than programming. However, I do need to know the use of all the BASIC commands and some of them aren't very clear in my instruction book. Here's an example of my problems (Basic Manual, chap. 14, #6): After typing in the 35 statements, and trying to run it, I got error report 2/2000. According to the report listed in the manual, a variable was used before it was assigned to a LET statement. By pressing ENTER, I could call up the first half of the listing and check it, which was okay. What I need to know is: How do I get the second half of the listing so that I can check it?

G.I. Lobdell, Estes Park, CO

To see program lines off the screen, press LIST, line number and ENTER. That line will appear at the top of the screen and you will be able to read those lines that follow.--AZ

ZX81 LOGIC SIGNALS

We probed a working ZX81 and a TS1000 with two Radio Shack digital logic probes, one was rated at 10MHz (part no. 22-301) and one was rated at 1.5MHz (22-300). Although the 1.5MHz probe is really too slow to be accurate on these signals, the information it provides may still be useful. H, L, and P indicate the High, Low, and Pulse lights on, respectively. Don't worry about the differences in the L&H lights if the P light is on. This may be caused by differences in logic probes (even the two probes we used gave different answers).

If your ZX/TS doesn't work, probe the bus and compare the readings on your logic probe with the ones in the chart. This will tell you what parts of your system aren't behaving correctly, which you may then investigate further. Here are our results:

Pin	10 MHz		1.5 MHz	
	Top	Bottom	Top	Bottom
---	----	----	----	----
1	HLP	H	HLP	H
2	HP	H	HLP	H
3	Slot		Slot	
4	LP	L	LP	L
5	HP	L	HLP	L
6	HP	P	HLP	L
7	HP	HP	HLP	HLP
8	HP	HP	HLP	HLP
9	HP	P	HLP	HLP
10	HP	HLP	HLP	HLP
11	HP	LP	HLP	LP
12	HP	LP	HP	HLP
13	HLP	LP	HLP	LP
14	P	P	LP	LP
15	HP	P	HP	LP
16	HP	HP	HLP	HLP
17	HP	HP	HP	HLP
18	H	LP	H	HLP
19	HP	HP	HP	HLP
20	H	HP	H	HLP
21	H	HLP	H	HLP
22	HP	HLP	HLP	HLP
23	HP	HP	HLP	HLP

SOFTWARE REVIEW

Program: ZETAPAK #3:
 SciFi Fantasy
 Price: \$9.95 + \$2.50 (S&H)
 ROM/RAM required?: 8K/1K
 Printed listings?: Yes
 Programs listable?: Yes
 Easy to Load?: Yes
 Challenge?: Fair
 Display?: Good
 From: Zeta Software, P.O. Box 3522
 Greenville, SC, 29608

For \$9.95 you get 6 games on tape and an instruction book with game listings.

PLANETFALL is a form of the game Lunar Lander. Because you don't have much control over your spaceship, it isn't my favorite.

HYPERSPACE DISPLAY, involves an asterisk (*) "going into hyperspace." Because all you can do is watch in this game, I didn't like it. (It's important to remember to type in GOTO 1 or the variable array A will be erased.)

In STARCATCHER, you move your craft (represented by an inverse C) up and down the screen trying to catch four stars. Yet, nothing happens when you catch a star.

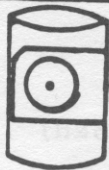
In WORMHOLE, you imagine yourself drifting in space. Suddenly, you are trapped in a hole trying to avoid asteroids. Yet, hitting an asteroid has no results.

In TURRET LASER, you move your ship onto a spot where a number is climbing rapidly. If a bomb hits your ship, it explodes. If you reach the number and drop the bomb first, you get points.

ARCADE INVADERS is a version of Space Invaders. When your aimed missiles should hit the approaching invaders, they miss. This fault made it #2 on my list.

These games are not challenging because of limited memory, but you can easily improve them.

Christopher Fabbro, S. Pasadena, CA



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TAPE LEVEL INDICATOR

Lots of people have trouble loading programs. This loading level indicator may help. This circuit does not reduce the recorder's output.

We chose to build an electronic level meter with LED bar-graph display using parts available at Radio Shack stores and many other distributors. This indicator plugs in-line between your computer and the power and ear cables. In use, the position and brightness of the LEDs show the output amplitude of your tape recorder.

All zero-volt (ground) connections for both power and signal should run individually to a tie point capable of accepting eight wires (one is a spare). Every lead must travel individually to this tie point--do not use shared wires to make any zero-volt connections. Attach leads from pins 2 & 4 of the LM3914N to this tie point. One end

of R2 must connect here as well as the 4 zero-volt leads from jacks.

Brightness of the LED display depends on R1. Current in the LEDs equals $12.5/R1$ units where R1 is in kOhms. We used the standard 10 mA drive and thus set $R1=1.2k\Omega$. A quarter-watt resistor will suffice.

Sensitivity depends on both R1 and R2. But with R1 chosen, R2 alone determines the extra signal needed to light the next LED. Use the formula $V=1.25(1+R2/R1)$ to calculate the voltage at which the 10th LED just lights. We want this to equal 5.0 volts, but we likewise want to employ standard resistor values. Our choices are: (1) use precision resistors of 1.2k & 3.6k; (2) use standard resistors of the same values and run uncalibrated; (3) use standard resistors of 1.2k & 3.9k and trim the 3.9k value for calibration. We used standard resistors and read relative levels.

If you want to calibrate your indicator, disconnect the ear cable. Apply a 5.0 volt signal (available at pin 1B of the ZX/TSous) to the input lead (pin 5 of the LM3914N) and try resistors parallel to the 3.9k. Start with 27k and work upward, substituting standard resistors in sequence until the 10th LED goes out. Use the last resistor that lights the 10th LED. (This procedure also works for a 3.6k resistor in the upper half of the 5% tolerance permitted. It fails for resistors of 3.9k at the low-tolerance edge, but you can substitute another. It's unlikely to be as low-valued.)

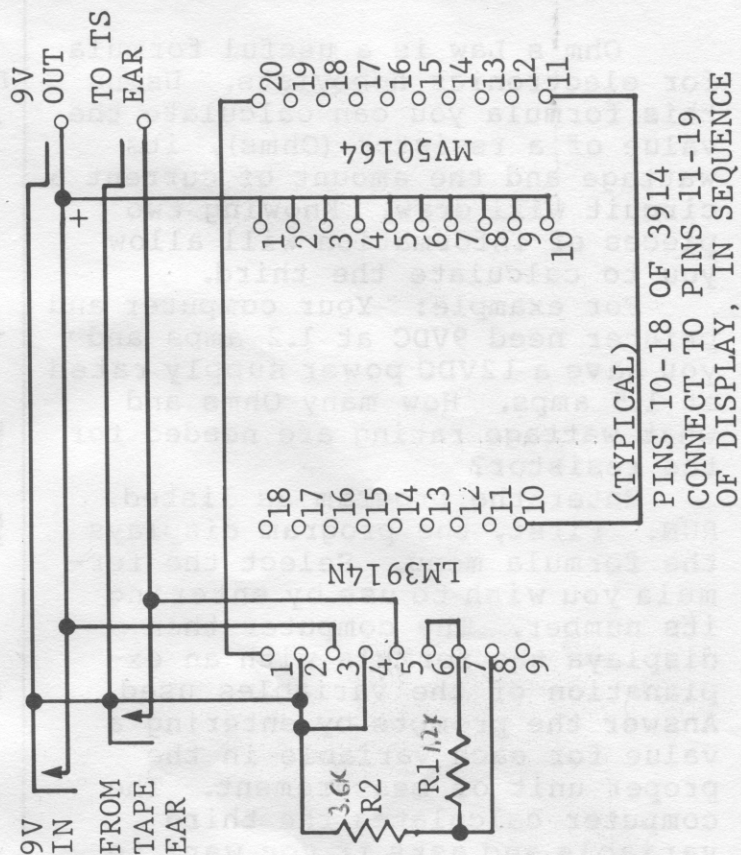
You can also do this trimming with a known good tape connected to the computer, and trim R2 until the 9th segment gives a bright, steady display during the program portion of the tape.

We used the following major parts from our local RS: LED display driver, LM3914N, RS276-1707; bar graph display, MV50164, RS276-081; and Experimenter's dual IC board, RS276-159. When using a

different board, get one that accepts 20-pin, 0.3" wide ICs-- they'll hold the 20 pin graph display. In operation, the computer clips the tape recorder output so the maximum amplitude is fixed. As you raise the volume, you'll see the bright dot climb to the segment corresponding to clipping, stop moving, and get brighter. As you decrease volume, the brightness of this segment drops and then the dot moves down.

During the quiet spot of a good tape, you probably won't see any segment light, or the lowest ones will flicker. During loading, the pattern quickly becomes obvious. The uppermost segment flickering off signifies dropouts, where the tape signal briefly dips below the clipping threshold. Such tapes may fail to load correctly, or at all.

Noisy tapes may give different intensity patterns on this monitor, but observing the TV screen often gives more insight.--KO



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OHM'S LAW--8K/16K

Ohm's Law is a useful formula for electronics hobbyists. Using this formula you can calculate the value of a resistor (Ohms), its wattage and the amount of current a circuit will draw. Knowing two pieces of information will allow you to calculate the third.

For example: Your computer and printer need 9VDC at 1.2 amps and you have a 12VDC power supply rated at 1.5 amps. How many Ohms and what wattage rating are needed for the resistor?

Enter the program as listed, RUN. First, the program displays the formula menu. Select the formula you wish to use by entering its number. The computer then displays the formula with an explanation of the variables used. Answer the prompts by entering a value for each variable in the proper unit of measurement. The computer calculates the third variable and asks if you want to continue. Yes gets you back to the menu; No ends the program.

Let's work through our example. Select the formula for calculating resistance. Input the voltage drop ($12-9=3$) and the current rating of the device, computer and printer (1.2 amps). You see that you need a 2.5 Ohm resistor to drop the voltage from the 12VDC available to the 9VDC needed. You next need to calculate the wattage for this resistor. Select formula 2 from the menu and enter the required variables (2.5 Ohms & 1.2 amps). You now know that you need a 2.5 Ohm resistor rated at least 3.6 watts in series with the power supply to safely run your computer and printer. (Remember: Voltage drop is the difference between available voltage and needed voltage. Express current in terms of amps., for example, 650 millamps = 0.65 amps.)

Blase Sanzone, Milford, CT

```

5 CLS
10 PRINT AT 0,10;"OHM'S LAW"
15 PRINT
20 PRINT "YOU CAN CALCULATE TH
E FOLLOWING:"
25 PRINT "-----"
30 PRINT "1 RESISTANCE (OHMS)"
35 PRINT "2 WATTS"
40 PRINT "3 CURRENT (AMPS)"
45 PRINT
50 PRINT "SELECT BY ENTERING A
NUMBER"
60 PAUSE 40000
70 LET K$=INKEY$
80 IF K$<"1" OR K$>"3" THEN GO
TO 70
90 GOTO VAL K$*100
100 CLS
105 PRINT "THE FORMULA FOR CALC
ULATING RESISTANCE IS: R=E/I"
110 PRINT
115 PRINT "E=VOLTAGE DROP (AVAIL
ABLE-NEEDED)"; "I=CURRENT (IN AMP
S)"
120 PRINT "*****"
125 PRINT "ENTER VOLTAGE DROP"
130 INPUT E
135 PRINT AT 6,20;E
140 PRINT "ENTER CURRENT IN AMP
S"
145 INPUT I
150 PRINT AT 7,20;I
155 LET R=E/I
160 LET X=R
165 GOSUB 400
170 LET R=X
175 PRINT AT 10,0;"A ";R;" OHM
RESISTOR IS NEEDED TO "; "REDUCE T
HE AVAILABLE VOLTAGE BY ";E;" VOL
TS" TO A DEVICE DRAWING ";I;" AM
PS"
180 GOTO 500
200 CLS
205 PRINT "THE FORMULA FOR CALC
ULATING WATTAGE IS: P=I**2*R"
210 PRINT
215 PRINT "I**2=CURRENT, IN AMPS
S SQUARED"; "R=RESISTANCE IN OHMS"
220 PRINT "*****"
225 PRINT "ENTER THE CURRENT"
230 INPUT I
235 PRINT AT 6,10;I
240 PRINT "ENTER RESISTANCE IN
OHMS"
245 INPUT R
250 PRINT AT 7,20;R
255 LET P=I**2*R
260 LET X=P
265 GOSUB 400
270 LET P=X
275 PRINT AT 10,0;"A ";R;" OHM
RESISTOR RATED AT ";P;" WATTS IS
NEEDED BY A "; "DEVICE DRAWING ";
I;" AMPS"
280 GOTO 500
300 CLS
305 PRINT "THE FORMULA FOR CALC
ULATING CURRENT IS: I=E/R"
310 PRINT
315 PRINT "E=VOLTAGE DROP"; "R=
RESISTANCE IN OHMS"
320 PRINT "*****"

```



```

325 PRINT "ENTER THE VOLTAGE DR
OP"
330 INPUT E
335 PRINT AT 6,23;E
340 PRINT "ENTER RESISTANCE IN
OHMS"
345 INPUT R
350 PRINT AT 7,25;R
355 LET I=E/R
360 LET X=I
365 GOSUB 400
370 LET I=X
375 PRINT AT 10,0;"THE MAXIMUM
CURRENT IS ";I;" AMPS","USING A
";R;" OHM RESISTOR TO","DROP THE
"AVAILABLE VOLTAGE BY ";E;" VOLTS"
380 GOTO 500
400 LET X=(INT (10*(X+(.05))))/
10
405 RETURN
500 PRINT AT 15,0;"DO YOU WANT
TO CONTINUE Y/N"
505 PAUSE 10000
510 IF INKEY$="Y" THEN GOTO 5
515 IF INKEY$="N" THEN STOP
SYNTACTIC SUM:19638, 8K/16K

```

FIFTEEN PUZZLE--8K/1K

This 8K/1K version of Fifteen Puzzle retains most features of the 4K version (Apr.82).

Invented by Sam Loyd in 1878, it consists of 15 numbered blocks and 1 space in a 4x4 matrix.

The objective is to order the matrix by moving the twin dashes horizontally or vertically with the the fewest moves.

```

1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 --

```

In line 4, B\$ first five characters are shift graphics 2, 4, 5, E, and S.

When you want to terminate the program, Enter STOP (shift A) and the screen will blank. To play Fifteen Puzzle again, just hit RUN, and ENTER.

Jon T. Passler, Beverly, MA

```

2 RAND
4 LET B$=" 11111$?"
5 LET S=0
8 DIM A$(16)
10 FOR I=1 TO 16
12 LET R=RND*16+.5
14 IF A$(R)<>" " THEN GOTO 12
16 LET A$(R)=CHR# I
18 NEXT I
20 FOR I=1 TO 15

```

```

22 IF I<9 THEN IF A$(CODE B$(I
))="(" THEN LET S=S+1
24 FOR J=I+1 TO 16
26 IF A$(I)>A$(J) THEN LET S=S
+1
28 NEXT J
30 NEXT I
32 IF INT (S/2)*2<>S THEN GOTO
6
34 CLS
36 FOR I=1 TO 16
38 LET S=CODE A$(I)
40 IF S<10 THEN PRINT " ";
42 IF S<16 THEN PRINT S;" ";
44 IF S=16 THEN PRINT "-- ";
46 IF INT (I/4)*4=I THEN PRINT
48 NEXT I
50 INPUT S
52 FOR I=1 TO 16
54 IF A$(I)=CHR# S THEN LET J=
I
56 IF A$(I)="(" THEN LET R=I
58 NEXT I
60 IF ABS (J-R)<>1 AND ABS (J-
R)<>4 THEN GOTO 50
62 LET A$(R)=A$(J)
64 LET A$(J)="("
66 GOTO 34
SYNTACTIC SUM: 38182, 8K

```

Bob Cutter of Arlington, MA reports that Poly Paks, Inc. offers a 9 volt adjustable 3 amp regulated power supply for \$19.92. 800/343-3046. In MA or outside US, 617/245-3828.

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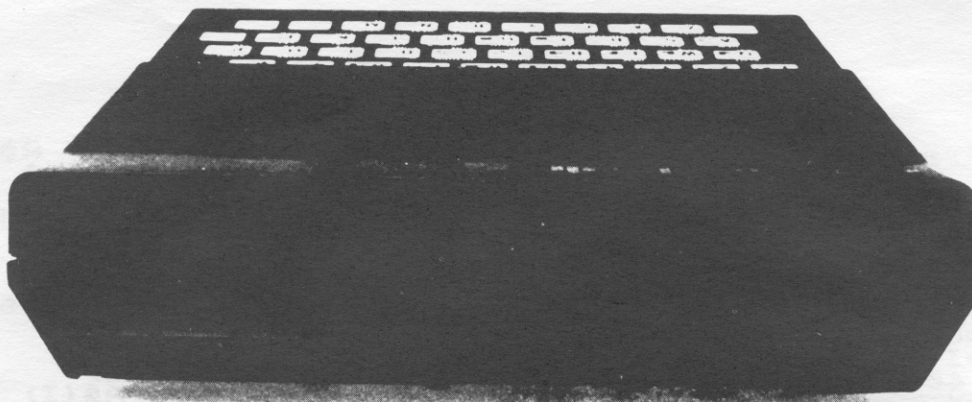
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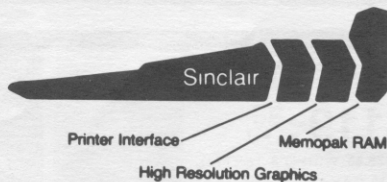
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MC PROGRAMMING--#9: JUMPING AROUND

Most of the machine code subroutines held in REM will be short around 100 instructions and data. Consequently, you won't need the "JP nn" instruction.

The Jump Relatives you use instead are harder to use correctly because of calculation-error for the offset ("e" as in JR e). But using JR makes the code relocatable in memory. JP NN specifies an absolute address, which changes if you store the program in a new zero place. JR e works anywhere because the location of the instruction remains unchanged when you relocate the program. JP nn is simple; control transfers to the address "nn" ($n1+(n2*256)$). Conditional JPs are available and are 3 bytes long.

JR e and conditionals are 2 bytes long, but the 2nd byte is added to the Program Counter +2 to transfer control to an unspecified relative address. Pointing "e" value to the right address is hard.

JR FOWARD

ADDRESS	DECIMAL	MNEMONIC	COMMENT
x02	40	JR Z	;x45-x02 ;=43
x03	41	e	;43-2=41=e
x04			;To test ;"e",
x45			;x02+43=x45
JR BACKWARD			
x059			:x126-x059= ;67 ;255-67=188 ;=e
x124			;To test ;"e",
x125	56	JR C	;255-188=67
x126	188	e	;x126-67= ;x059

JRs are limited to 129 foward addresses and 126 backward addresses, enough leeway for most MC subroutines held in REM lines.

Jon Bobst, Zeta Software, PO Box
3522, Greenville, SC 29608-3522

UNIT PRICER--8K/2K

This 8K/2K program calculates the unit price of two similar products. To run the program, just follow the directions remembering that units are ounces, grams, etc. If you want to exit the program early, enter XX.

The idea for this program came from William Scott Watson's book entitled 67 Ready-To-Run Programs In Basic, written for TRS-80 Level 1 BASIC. Offered by Tab Books Inc. of Blue Ridge Summit PA., (\$12.95) it contains programs in the graphic, home, business, education and games areas. In addition to the programs it offers, I found it to be a very good resource book and I recommend it to any ZX/TS user.

Stephen Zachev, Muskegon, MI

5 REM UP
10 PRINT "THIS PROGRAM COMPARE
5 PRODUCTS A AND B BASED ON UNIT
PRICE"

(GOTO Page 20)

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```

84 LET A$="FIRST PRODUCT"
85 PRINT
90 PRINT "HOW MUCH DOES ";A$;"
COST"
95 INPUT A
96 PRINT
97 PRINT "HOW MANY UNITS IN PR
ODUCT A"
98 INPUT B
99 LET B$="SECOND PRODUCT"
100 PRINT
101 PRINT "HOW MUCH DOES ";B$;"
COST"
102 INPUT C
103 PRINT
104 PRINT "HOW MANY UNITS IN PR
ODUCT B"
105 INPUT D
106 CLS
107 LET E=A/B
108 LET F=C/D
109 LET E=E*100
110 LET F=F*100
111 PRINT A$;"=";"E;" CENTS PER
UNIT"
112 PRINT
113 PRINT B$;"=";"F;" CENTS PER
UNIT"
114 PRINT
115 IF E<F THEN GOTO 300
116 IF E=F THEN GOTO 400
117 PRINT B$;" IS A BETTER BUY
ACCORDING TO UNIT PRICE"
118 GOTO 450
300 PRINT A$;" IS A BETTER BUY
ACCORDING TO UNIT PRICE"
400 PRINT "BOTH PRODUCTS EQUALL
Y PRICED"
450 STOP
SYNTACTIC SUM: 33047, 2K

```

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RD 2, Box 457, Harvard, MA 01451.

Telephone 617/456-3661.

12 issues, \$29. Single issue, \$4.

Publisher: Kirtland H. Olson

Editor: Ann L. Zevnik

Assistant Editor: Pamela Petrakos-
Wilson

Editorial Assistant: Pamela K. Vinal

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